Chapter 9. North Lahontan Hydrologic Region

Setting

The North Lahontan Hydrologic Region forms part of the western fringe of the Great Basin, a large landlocked area that includes most of Nevada and northern Utah. It stretches about 270 miles from the Oregon border to the southern boundary of the Walker River drainage in Mono County (Figure 9-1). The region covers 6,080 square miles, about 4 percent of California's total area. The region includes portions of Modoc, Lassen, Sierra, Nevada, Placer, El Dorado, Alpine, Tuolumne, and Mono Counties. At its widest part, the region measures about 60 miles across; it narrows to scarcely 2 miles in southern Sierra County. Major rivers of the region flow into Nevada. The mountain crests forming the western boundary of the region range up to elevation 11,000 feet.

Climate

The region's climate is characterized by dry summers with the exception of occasional scattered thundershowers. Winter precipitation ranges from less than 5 inches in the valleys of Eastern Modoc and Lassen Counties to about 30 inches in the Walker Mountains to more than 60 inches in the Sierra Nevada that form the western boundary of the area and drain into the Truckee and Walker River Basins. Most of the winter precipitation consists of snow in the valleys, which usually melts between storms. Snow generally accumulates in mountain areas above 5,000 feet over the winter months. The snow becomes a source of water for the late spring and summer months.

Population

Only about 99,000 people, a quarter of one percent of California's population, live in the North Lahontan Region. The principal population center is Susanville, the county seat of Lassen County.

Land Use

Much of the region is national forest and lands under the jurisdiction of the Bureau of Land Management. Cattle ranching is the principal agricultural activity with pasture and alfalfa being the dominant irrigated crops. Commercial crop production is limited because of the short growing season. Although growing seasons vary considerably each year the mountain valleys where the majority of the crops are grown are usually frost free from late May to mid-September or about 120 days.

Tourism and recreation are the principal economic activities in the Truckee-Tahoe area and the surrounding mountains. On a typical summer day, the number of visitors within the Tahoe Basin may equal the number of full-time residents. The principal consumptive use of applied water used for the for environment are those of State Wildlife Areas around Honey Lake which provide important habitat for waterfowl and several threatened or endangered species, including the bald eagle, sand hill crane, bank swallow, and peregrine falcon.

Water Supply and Use

Natural runoff of the streams and rivers averages around 2 million acre-feet per year, of which only about one-quarter is in the drier northern portion. The largest rivers in the region and their approximate average runoff at the Nevada line are: the Truckee with 600,000 acre-feet; the Carson, 400,000 acre-feet; and the

Walker, 500,000 acre-feet. The Susan River is the only major stream in the northern half of the region; its annual discharge at Susanville averages around 60,000 acre-feet.

The Truckee, Carson, and Walker Rivers are governed in large part by existing federal court water rights decrees administered by court-appointed water masters. The interstate nature of the rivers, combined with the long history of disputes over water rights, has created a complex system of river management criteria. On the Carson River for example, it took the federal court 55 years to sort out the water rights and issues of the Alpine Decree, which governs operation of the river today.

Much of the supply from the Truckee, Carson, and Walker rivers is reserved for use by Nevada interests under various water rights settlements and agreements. Most locally developed water supplies are from groundwater or small surface water diversions, with storage provided by outlet dams constructed on natural lakes. Federal water storage projects in the region include Stampede Reservoir, Boca Reservoir, and Prosser Creek Reservoir, constructed primarily to provide water supply for Nevada urban and agricultural water use, downstream flood protection, protection of threatened and endangered species and local recreation. The U.S. Army Corps of Engineers also completed the Martis Creek Dam in 1971 to provide additional flood protection for the Reno-Sparks area.

Land irrigated by surface water generally has a higher than normal applied water rate; when possible a portion of the spring runoff is spread on the soil to deep percolate and recharge groundwater basins rather than being allowed to flow to saline lakes and evaporate. Since most of the surface water irrigation operates with non-firm water supply; irrigated acreage and the length of time irrigation water is available fluctuates annually. The crop most subject to these changes is irrigated pasture. Even though acreage is some areas can remain relatively stable, the length of the irrigation season is often shortened since runoff generally decreases as summer progresses.

There are 24 groundwater basins and two subbasins recognized in the region. Thirteen of these basins are shared with Nevada and one with Oregon. These basins cover approximately 1,033,240 acres (1,610 square miles) or about 26 percent of the entire region. Groundwater storage capacities are available for only six of the 26 basins/subbasins and the combined storage for these basins is estimated at between 23.5 to 24.0 maf. Although the groundwater basins were delineated based on mapped alluvial fill, much of the groundwater produced in many of them actually comes from underlying fractured rock aquifers. This is particularly true in the volcanic areas of Modoc and Lassen Counties where, in many basins, volcanic flows are interstratified with lake sediments and alluvium. Wells constructed in the volcanics commonly produce large amounts of groundwater, whereas, wells constructed in fine-grained lake deposits produce less. Because the thickness and lateral extent the of the hard rocks out of the defined basin are generally not known, actual groundwater in storage in these areas is unknown.

About 5,000 acre-feet of reclaimed wastewater are exported out of the Tahoe Basin by South Tahoe Public Utility District for agricultural use in the Carson River watershed. Truckee Tahoe Sanitation Agency treats wastewater from the Tahoe Basin and returns about 4,000 acre-feet (which is used downstream in Nevada and does not contribute to California's supplies). The Susanville Sanitary District reclaims over 3,000 acre-feet of wastewater for use on nearby irrigated pasturelands.

The principal consumptive uses of water for environmental uses in the region are those of State Wildlife Areas around Honey Lake. The Honey Lake Wildlife Area in southern Lassen County consists of the

4,271-acre Dakin Unit and the 3,569-acre Fleming Unit. The two units provide important habitat for several threatened or endangered species, including the bald eagle, sand hill crane, bank swallow, and peregrine falcon. This wildlife area has winter storage rights from the Susan River from November 1 until the last day of February. The HLWA also operates eight wells, each producing between 1,260 and 2,100 gallons per minute. In an average year, the HLWA floods 3,000 acres by March 1 for waterfowl brood habitat.

In 1989, the California department of Fish and Game purchased the 2,714-acre Willow Creek Wildlife Area in Lassen County to preserve existing wetlands and to increase the potential for waterfowl production and migration habitat. About 2,000 acres are wetlands and riparian habitats. The endangered bald eagle and sand hill crane also inhabit this area. In addition to the Honey Lake and Willow Creek Wildlife Areas, DFG operates the Doyle Wildlife Area, also in the Honey Lake Basin. This wildlife area is persevered as dryland winter range for deer and requires less water than the Honey Lake or Willow creek areas.

The following water balance table summarizes the detailed regional water accounting contained in the water portfolio at the end of this regional description. As shown in the table more water flows into Nevada than is consumptively used in the region.

State of the Region

Challenges

Although Lake Tahoe contains over 122 million acre-feet of pristine mountain water (*nearly three times the capacity of California's more than 1,300 reservoirs*), much of the North Lahontan Region is chronically short of water. In the northern portion of the Region, drought is a way of life for agriculture; irrigation continues as long as water is available and then stops. During dry years many areas with little or no storage may only have surface water available for a short period early in the season and then may only be able to irrigate a limited acreage if they do not supplement their surface water supply with groundwater. In Modoc and Lassen Counties some groundwater well pumping capacities diminish very rapidly even during the first year of a drought. While the Truckee River Operating Agreement has the potential to settle 50 years of disputes over Truckee and Carson River waters, the execution and implementation of that agreements will require considerable effort in the coming years.

The States of California and Nevada have been participating in a confidential mediation that could affect water users in both states. The primary issue of concern is the declining level of Walker Lake in Nevada and the resulting impact on the lake's fishery. The water level at Walker Lake has declined from an elevation of about 4,080 feet in 1882 to 3,941 feet in 2003; salinity has increased during the same period from about 2,500 mg/L TDS to 13,200 mg/L TDS. To maintain lake salinity at the current level, about 33 taf/yr more inflow is needed. Other issues that could also affect existing water users are the potential tribal water rights claims far downstream on the Nevada side of the basin.
Water quality in the region is generally very good but many communities face specific water quality problems. These include groundwater contamination from septic tank discharges in urban subdivision areas such as Susanville and Eagle Lake, and MTBE contamination in South Lake Tahoe. Drinking water quality has also become a greater issue for many surface water systems around Lake Tahoe, forcing many of the smaller private systems to consolidate or change ownership because they are unable to afford the new monitoring and treatment regulatory requirements. Even South Tahoe Public Utility District, the

largest water purveyor in the basin, is experiencing some difficulty in meeting these requirements. The abandoned Leviathan Mine, a Superfund site, impacts local creeks with acid mine drainage. The top water quality issues emerging from the Lahontan RWQCB's 2003 Triennial Review included revising waste discharge prohibition affecting piers in Lake Tahoe, and the sodium standards for Carson and Walker Rivers and their tributaries.

Lake Tahoe, in fact, is the subject of its own chapter in the region's basin plan, and receives many specific and extraordinary water quality protections. The Porter-Cologne Water Quality Control Act bans the discharge of domestic wastewater from California in the Lake Tahoe basin; the same ban is in Nevada by executive order, resulting in the export of all domestic wastewater from the basin. Discharges of industrial wastewater, wastes from boats and marinas, food wastes, and solid waste are also prohibited in the Tahoe basin. Lake Tahoe's clarity has declined as development has increased around the shoreline, increasing the sediment load and nutrients reaching the lake and its tributaries. Nutrients, such as nitrogen and phosphorous used in landscaping fertilizers, can enter the lake via storm water runoff, promoting growth of algae and thereby reducing clarity. Nitrogen pollution in the basin is primarily due to vehicles, while phosphorous is mostly derived from erosion and dust (phosphate-based detergents are banned). Roads and road maintenance activities, including snow removal and deicing, are restricted because of erosion and other impacts. Previous use of salt for road de-icing by Caltrans had resulted in the killing of trees and plants that prevent erosion and thus sediment from reaching the lake. Forest fires, grazing, and logging—and subsequent erosion and runoff of nutrients—also present a threat to the lake's water clarity. Agricultural use of pesticides in the Lake Tahoe basin is prohibited, and the Tahoe Regional Planning Agency has banned the use of two-stroke engines on Lake Tahoe to prevent contamination from gasoline components such as benzene and MTBE. Other restrictions on land development and disturbance, as well as programs involving pollution offsets, BMP retrofits, and land purchase, are also utilized to preserve and improve lake water quality. Lake Tahoe is extensively monitored by the UC Davis Tahoe Research Group.

California local interests in the northern part of the region have been apprehensive about Reno area's aggressive quest for additional water supplies. In the late 1980's, the Silver State Plan triggered concerns as far north as Modoc County (*Over 150 miles north of Reno*). The plan envisioned constructing a pipeline north nearly to the Oregon border to tap groundwater basins, some of which extend across the California-Nevada line. More recently, the proposed Truckee Meadows Project generated concern about depletion of groundwater supplies.

Tahoe's clarity has been declining as increasing development around the shoreline increase the sediment load and nutrients reaching the lake. Nutrients, such as nitrogen and phosphorous used in lawn or golf course fertilizers, can enter the lake in the form of storm water runoff. Nutrients promote growth of algae, reducing clarity. Clarity of the lake is measured by the depth to which a Secchi disk, a small plastic disk of specific size, is visible. In the late 1960s, average Secchi disk visibility in Lake Tahoe was about 100 feet; now the figure is closer to 70 feet

Accomplishments

Years of disputes over the waters of the Truckee and Carson rivers led to congressional enactment of the Truckee-Carson-Pyramid Lake Water Rights Settlement Act in 1990. The act makes an interstate allocation of the waters between California and Nevada, provides for the settlement of certain Native American rights claims, and provides for water supplies for specified environmental purposes in Nevada.

The act allocates to California: 23,000 acre-feet annually in the Lake Tahoe Basin; 32,000 acre-feet annually in the Truckee River Basin below Lake Tahoe; and water corresponding to existing water uses in the Carson River Basin. Provisions of the Settlement Act, including the interstate water allocation, will not take effect until several conditions are met, which includes the Truckee River Operation Agreement.

Negotiation of a proposed Truckee River Operating Agreement (TROA) and preparation of an EIR/EIS for the TROA began in 1991. The draft EIR/EIS was released for public review in 1998 and was completed in 1999. PL101-618 settled years of dispute over Truckee and Carson River waters by making an interstate allocation between California and Nevada. It also settled certain tribal water rights claims and provided for water supplies for specified environmental purposes in Nevada. When executed, the TROA would establish river operations procedures to meet water rights on the Truckee River and to enhance spawning flows in the lower Truckee River for cui-ui and Lahontan cutthroat trout. TROA would provide for management of water within the Truckee Basin in California, including instream flow requirements and reservoir storage for fishery and recreation uses, and would include procedures for coordinating releases and exchanges of water among the watershed's reservoirs. TROA would become the exclusive federal regulations governing releases of water stored in Lake Tahoe, Martis Creek, Prosser Creek, Stampede, and Boca Reservoirs. The agreement would provide an accounting procedure for surface and groundwater diversions in California's part of the Truckee Basin and would establish criteria to minimize short-term reductions in river flow potentially caused by future well construction near the river. In 1993, an agreement was signed by Sierra Pacific Power Company, Washoe County Water Conservation District, and Sierra Valley Water Company settling a dispute about when the water company was required to stop diverting water from the Little Truckee River. This agreement, which resolves disputes that had often occurred during droughts, is being incorporated into the proposed TROA. Issues of concern to California include: (1) surface and ground water allocations to the states, including accounting procedures such as water used for snowmaking at the local ski resorts, and (2) operation of the Lake Tahoe Dam at Tahoe City and provisions for pumping water from the lake when sufficient water cannot be released during drought events.

Programs to manage Lake Tahoe water quality by regulating development and preventing pollutants from reaching the lake are being implemented at the federal, state, and local levels. The Tahoe Regional; Planning Agency, a bistate agency created by Congress, sets regional environmental standards, issues land use permits (*Including conditions to protect water quality*), and takes enforcement actions throughout the basin. TRPA's regional plan provides for achievements and maintenance of environmental targets by managing growth and development. In addition to its regulatory activities, TRPA carries out a capital improvement program to repair environmental damage done before its regional plan was adopted. TRPA has identified nearly $500 million in capital improvements needed to achieve environmental targets. Federal, state, and local governments have invested nearly $90 million in erosion control, storm water drainage, stream zone restoration, public transit, and other capital projects. The USFS's Lake Tahoe Basin Management Unit controls over 70 percent of the land in the Tahoe Basin. The LTBMU has implemented a watershed restoration program and a land acquisition program to prevent development of sensitive private lands. In recent years, federal and state agencies have increased funding to protect the environment of Lake Tahoe. The State of Nevada approved a $20 million bond measure to perform erosion control and other measures on the east side of the lake. In California, Proposition 204 provides $10 million in bond funds for land acquisition and programs to control soil erosion, restore watersheds, and preserve environmentally sensitive lands.

The Department of Fish and Game is also concerned about maintaining instream flows and reservoir pools on the California reaches of Carson Walker Rivers (*Portion of which are protected by the California Wild and Scenic River Act*). In conjunction with American Land Conservancy, a private land trust organization. DFG has been acquiring lands and water rights at Heenan Lake in the upper watershed of the East Fork Carson River. This small reservoir, formerly used to supply irrigation water for lands in Nevada, is now being used by DFG to raise Lahontan cutthroat trout to stock in other locations throughout the Sierra Nevada. Parts of the upper Carson River area is managed by DFG as wild trout waters, where stocking of hatchery fish is not allowed. Recreational trout fishing is a popular activity on both the upper Carson and Walker rivers.

Relationship with Other Regions

An average of about 2,000 acre-feet per year is exported from the Tahoe Basin to the South Fork American River in conjunction with a power development that began in 1876. Another export of about 6,000 acre-feet goes from the Little Truckee River for irrigation use in Sierra Valley (Feather River Basin of Sacramento Region). Much of the supply from the Truckee, Carson, and Walker rivers is reserved for use by Nevada interests under various water rights settlements and agreements. In northern Lassen County, an average of about 3,000 acre-feet is imported from a tributary of the South Fork Pit River (Sacramento River Region) for irrigation in the Madeline Plains area.

Looking to the Future

No major changes in water use are anticipated in the near future in the northern portion of the region. A small amount of agricultural expansion is expected in areas that can support additional groundwater development. Likewise, the modest need for additional municipal and irrigation supplies can be met by some expansion of present surface systems or by increased use of groundwater.

Concern over protecting groundwater resources has led to establishment of formal groundwater management mechanisms in the Honey Lake and Long Valley basins. Similar arrangements are being considered in Surprise Valley and the pending interstate allocation establishes limits on groundwater withdrawals in the Lake Tahoe and Truckee basins. At present, neither the Honey Lake nor Long Valley groundwater management districts are active, but the can be activated when needed.

The Truckee, Carson and Walker rivers are currently controlled by federal water masters according to federal court decrees. Each of these decrees may be revised to some degree within the nest few years through a settlement agreement for the Truckee River and through mediation for the Walker River. Since further water development in these basins may be limited, especially in Nevada, water transfers will increasingly be used to meet changing or higher priority needs within the basins. This has resulted in acquisition of some agricultural land and water rights to meet municipal needs downstream in Reno/Sparks and environmental needs throughout the basins. Northern California counties lack the resources and funding to assist them with regional or local plans.

Water Portfolios for Water Years 1998, 2000, and 2001

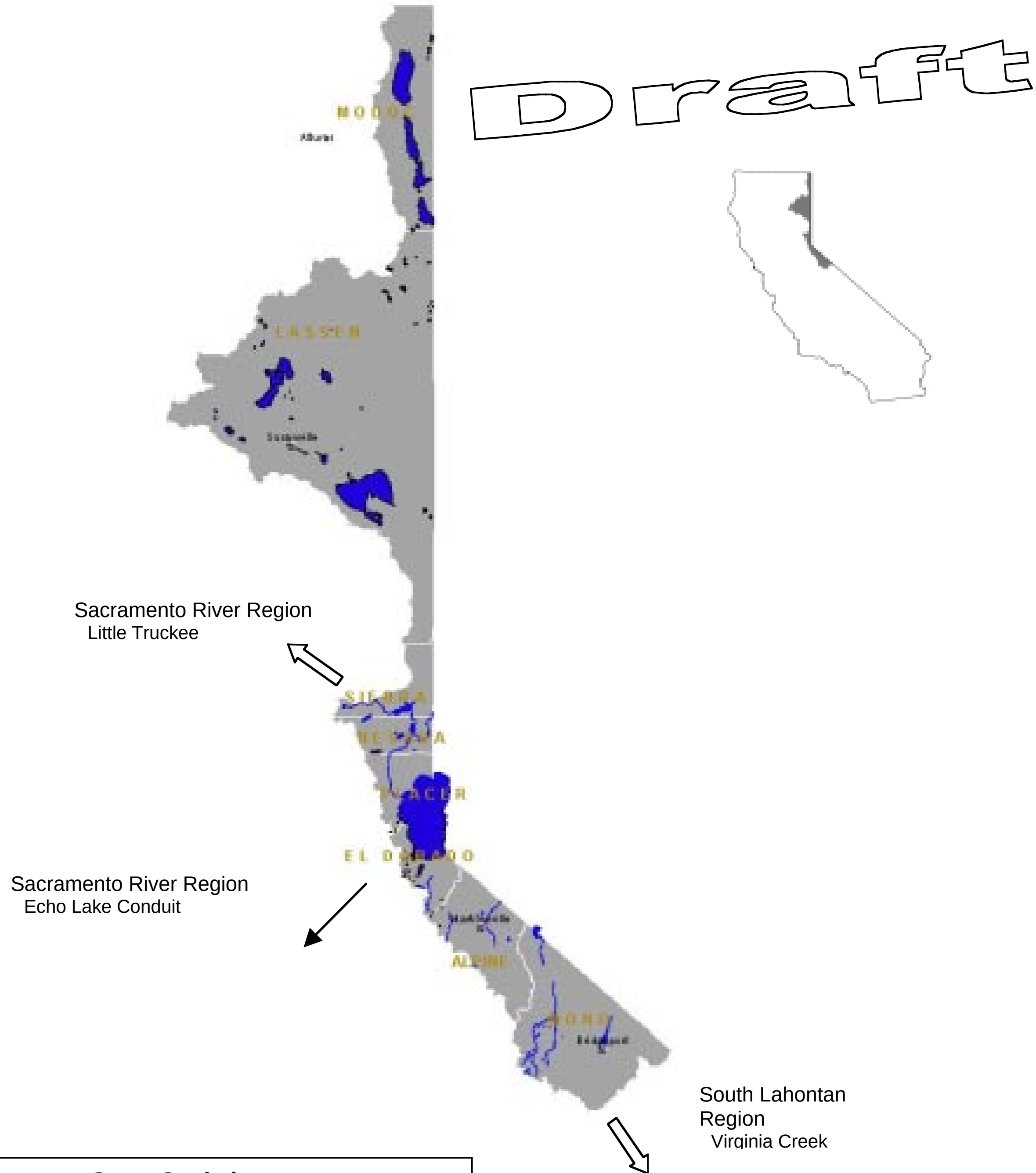
The following tables present actual information about the water supplies and uses for the North Lohanton hydrologic region. Water year 1998 was a wet year for this region, with annual precipitation at 135 percent of normal, while the statewide annual precipitation was 170 percent of average. Year 2000 represents less than normal hydrologic conditions with annual precipitation at 80 percent of average for the North Lohanton region, and year 2001 reflected dryer water year conditions with annual precipitation at 50 percent of average. For comparison, statewide average precipitation in year 2001 was 75 percent of normal. Table 9-1 provides more detailed information about the total water supplies available to this region for these three specific years from precipitation, imports and groundwater, and also summarizes the uses of all of the water supplies. The three water portfolio tables included in Table 9-2 and companion Water Portfolio flow diagrams Figures 9-2, 9-3 and 9-4 provided more detailed information about how the available water supplies are distributed and used throughout this region.

A more detailed tabulation of the portion of the total available water that is dedicated to urban, agricultural and environmental purposes is presented in Table 9-3. Because most of the North Lohanton region is largely undeveloped, dedicated environmental water uses are a larger component of the total developed water uses in this region. Table 9-3 also provides detailed information about the sources of the developed water supplies.

Sources of Information

- Water Quality Control Plan, Regional Water Quality Control Board
- Watershed Management Initiative Chapter, Regional Water Quality Control Board
- 2002 California 305(b) Report on Water Quality, State Water Resources Control Board
- Bulletin 118 (Draft), California's Groundwater, Update 2003, Department of Water Resources
- Nonpoint Source Program Strategy and Implementation Plan, 1998-2013, State Water Resources Control Board, California Coastal Commission, January 2000
- Strategic Plan, State Water Resources Control Board, Regional Water Quality Control Boards, November 15, 2001

Figure 9-1
NORTH LAHONTAN HYDROLOGIC REGION



Some Statistics

- Area - 6,122 square miles (3.9% of State)
- Average annual precipitation – 23.1 inches
- Year 2000 population - 99,035
- 2030 population projection – 155,065
- Total reservoir storage capacity - 1,181 TAF
- 2000 irrigated agriculture - 125,200 acres

Table 9-1
North Lahontan Hydrologic Region Water Balance Summary – TAF

Water Entering the Region – Water Leaving the Region = Storage Changes in Region

	1998 (wet)	2000 (average)	2001 (dry)
Water Entering the Region			
Precipitation	10,655	6,708	3,756
Inflow from Oregon/Mexico	0	0	0
Inflow from Colorado River	0	0	0
Imports from Other Regions	0	0	3
Total	**10,655**	**6,708**	**3,759**
Water Leaving the Region			
Consumptive Use of Applied Water * (Ag, M&I, Wetlands)	263	330	307
Outflow to Nevada	1,391	754	552
Exports to Other Regions	12	12	9
Statutory Required Outflow to Salt Sink	180	141	113
Additional Outflow to Salt Sink	83	94	91
Evaporation, Evapotranspiration of Native Vegetation, Groundwater Subsurface Outflows, Natural and Incidental Runoff, Ag Effective Precipitation & Other Outflows	8,569	5,484	3,295
Total	**10,498**	**6,815**	**4,367**
Storage Changes in the Region [+] Water added to storage [–] Water removed from storage			
Change in Surface Reservoir Storage	147	-66	-430
Change in Groundwater Storage **	10	-41	-178
Total	**157**	**-107**	**-608**

Applied Water * (compare with Consumptive Use) * Definition - Consumptive use is the amount of applied water used and no longer available as a source of supply. Applied water is greater than consumptive use because it includes consumptive use, reuse, and outflows.	432	528	489

**Footnote for change in Groundwater Storage

Change in Groundwater Storage is based upon best available information. Basins in the north part of the State (North Coast, San Francisco, Sacramento River and North Lahontan Regions and parts of Central Coast and San Joaquin River Regions) have been modeled – spring 1997 to spring 1998 for the 1998 water year and spring 1999 to spring 2000 for the 2000 water year. All other regions and year 2001 were calculated using the following equation:

GW change in storage =
intentional recharge + deep percolation of applied water + conveyance deep percolation – withdrawals

This equation does not include the unknown factors such as natural recharge and subsurface inflow and outflow.

Table 9-2
Water Portfolios for Water Years 1998, 2000 and 2001

Category	Description	North Lahontan 1998 (TAF) Water Portfolio	Applied Water	Net Water	Depletion	North Lahontan 2000 (TAF) Water Portfolio	Applied Water	Net Water	Depletion	North Lahontan 2001 (TAF) Water Portfolio	Applied Water	Net Water	Depletion	Data Detail
Inputs:														
1	Colorado River Deliveries		-				-				-			PSA/DAU
2	Total Desalination		-				-				-			PSA/DAU
3	Water from Refineries		-				-				-			PSA/DAU
4a	Inflow From Oregon		-				-				-			PSA/DAU
b	Inflow From Mexico		-				-				-			PSA/DAU
5	Precipitation	10,654.6				6,708.3				3,755.9				REGION
6a	Runoff - Natural	N/A				N/A				N/A				REGION
b	Runoff - Incidental	N/A				N/A				N/A				REGION
7	Total Groundwater Natural Recharge	N/A				N/A				N/A				REGION
8	Groundwater Subsurface Inflow	N/A				N/A				N/A				REGION
9	Local Deliveries		501.4				469.5				311.8			PSA/DAU
10	Local Imports		0.3				0.3				3.3			PSA/DAU
11a	Central Valley Project :: Base Deliveries		-				-				-			PSA/DAU
b	Central Valley Project :: Project Deliveries		-				-				-			PSA/DAU
12	Other Federal Deliveries		-				-				-			PSA/DAU
13	State Water Project Deliveries		-				-				-			PSA/DAU
14a	Water Transfers - Regional		-				-				-			PSA/DAU
b	Water Transfers - Imported		-				-				-			PSA/DAU
15a	Releases for Delta Outflow - CVP		-				-				-			REGION
b	Releases for Delta Outflow - SWP		-				-				-			REGION
c	Instream Flow		84.6				85.0				84.5			REGION
16	Environmental Water Account Releases		-				-				-			PSA/DAU
17a	Conveyance Return Flows to Developed Supply - Urban		-				-				-			PSA/DAU
b	Conveyance Return Flows to Developed Supply - Ag		-				-				-			PSA/DAU
c	Conveyance Return Flows to Developed Supply - Managed Wetla		-				-				-			PSA/DAU
18a	Conveyance Seepage - Urban		-				-				-			PSA/DAU
b	Conveyance Seepage - Ag		5.8				3.6				2.1			PSA/DAU
c	Conveyance Seepage - Managed Wetlands		-				-				-			PSA/DAU
19a	Recycled Water - Agriculture		5.0				5.0				5.0			PSA/DAU
b	Recycled Water - Urban		-				-				-			PSA/DAU
c	Recycled Water - Groundwater		-				-				-			PSA/DAU
20a	Return Flow to Developed Supply - Ag		-				-				-			PSA/DAU
b	Return Flow to Developed Supply - Wetlands		-				-				-			PSA/DAU
c	Return Flow to Developed Supply - Urban		1.5				2.0				1.8			PSA/DAU
21a	Deep Percolation of Applied Water - Ag		19.8				28.9				29.3			PSA/DAU
b	Deep Percolation of Applied Water - Wetlands		0.3				0.4				0.3			PSA/DAU
c	Deep Percolation of Applied Water - Urban		12.7				13.3				12.6			PSA/DAU
22a	Reuse of Return Flows within Region - Ag		27.9				36.2				30.8			PSA/DAU
b	Reuse of Return Flows within Region - Wetlands, Instream, W&S		313.5				181.9				126.9			PSA/DAU
24a	Return Flow for Delta Outflow - Ag		-				-				-			PSA/DAU
b	Return Flow for Delta Outflow - Wetlands, Instream, W&S		-				-				-			PSA/DAU
c	Return Flow for Delta Outflow - Urban Wastewater		-				-				-			PSA/DAU
25	Direct Diversions	N/A				N/A				N/A				PSA/DAU
26	Surface Water in Storage - Beg of Yr	853.2				903.5				837.6				PSA/DAU
27	Groundwater Extractions - Banked	-				-				-				PSA/DAU
28	Groundwater Extractions - Adjudicated	-				-				-				PSA/DAU
29	Groundwater Extractions - Unadjudicated	88.5				161.6				234.9				REGION
Withdrawals:	In Thousand Acre-feet													
23	Groundwater Subsurface Outflow	N/A				N/A				N/A				REGION
30	Surface Water Storage - End of Yr	1,000.0				837.6				407.8				PSA/DAU
31	Groundwater Recharge-Contract Banking		-				-				-			PSA/DAU
32	Groundwater Recharge-Adjudicated Basins		-				-				-			PSA/DAU
33	Groundwater Recharge-Unadjudicated Basins		-				-				-			REGION
34a	Evaporation and Evapotranspiration from Native Vegetation				N/A				N/A				N/A	REGION
b	Evaporation and Evapotranspiration from Unirrigated Ag				N/A				N/A				N/A	REGION
35a	Evaporation from Lakes				294.6				313.6				317.6	REGION
b	Evaporation from Reservoirs				175.5				213.7				267.6	REGION
36	Ag Effective Precipitation on Irrigated Lands		55.8				32.1				8.5			REGION
37	Agricultural Use		375.1	327.4	327.4		462.4	397.3	397.3		428.4	368.3	368.3	PSA/DAU
38	Wetlands Use		18.7	13.4	13.4		25.9	20.7	20.7		20.5	17.1	17.1	PSA/DAU
39a	Urban Residential Use - Single Family - Interior		3.5				4.2				3.7			PSA/DAU
b	Urban Residential Use - Single Family - Exterior		5.1				5.1				5.9			PSA/DAU
c	Urban Residential Use - Multi-family - Interior		4.4				4.8				5.0			PSA/DAU
d	Urban Residential Use - Multi-family - Exterior		1.1				1.2				1.3			PSA/DAU
40	Urban Commercial Use		9.0				9.7				9.3			PSA/DAU
41	Urban Industrial Use		12.5				12.5				12.5			PSA/DAU
42	Urban Large Landscape		2.3				2.6				2.6			PSA/DAU
43	Urban Energy Production		-				-				-			PSA/DAU
44	Instream Flow		84.6	84.6	84.6		85.0	85.0	85.0		84.5	84.5	84.5	PSA/DAU
45	Required Delta Outflow		-	-	-		-	-	-		-	-	-	PSA/DAU
46	Wild & Scenic Rivers Use		404.1	95.6	95.6		233.3	56.2	56.2		152.5	28.7	28.7	PSA/DAU
47a	Evapotranspiration of Applied Water - Ag				241.1				301.3				281.1	PSA/DAU
b	Evapotranspiration of Applied Water - Managed Wetlands				13.2				19.8				16.9	PSA/DAU
c	Evapotranspiration of Applied Water - Urban				8.8				8.7				9.4	PSA/DAU
48	Evaporation and Evapotranspiration from Urban Wastewater				N/A				N/A				N/A	REGION
49	Return Flows Evaporation and Evapotranspiration - Ag				19.5				20.2				12.5	PSA/DAU
50	Urban Waste Water Produced	24.6				26.5				26.5				REGION
51a	Conveyance Evaporation and Evapotranspiration - Urban				-				-				-	PSA/DAU
b	Conveyance Evaporation and Evapotranspiration - Ag				2.3				1.7				1.0	PSA/DAU
c	Conveyance Evaporation and Evapotranspiration - Managed Wetlands				0.2				0.3				0.2	PSA/DAU
d	Conveyance Loss to Mexico				-				-				-	PSA/DAU
52a	Return Flows to Salt Sink - Ag				68.3				76.9				74.7	PSA/DAU
b	Return Flows to Salt Sink - Urban				14.9				16.1				16.5	PSA/DAU
c	Return Flows to Salt Sink - Wetlands				-				0.6				-	PSA/DAU
53	Remaining Natural Runoff - Flows to Salt Sink				180.2				141.2				113.2	REGION
54a	Outflow to Nevada				1,390.6				753.9				551.9	REGION
b	Outflow to Oregon													REGION
c	Outflow to Mexico													REGION
55	Regional Imports	0.3				0.3				3.3				REGION
56	Regional Exports	11.9				11.8				9.2				REGION
59	Groundwater Net Change in Storage	10.0				-41.3				-177.5				REGION
60	Surface Water Net Change in Storage	146.8				-65.9				-429.8				REGION
61	Surface Water Total Available Storage	1,181.2				1,181.2				1,181.2				REGION

Colored spaces are where data belongs. N/A - Data Not Available "-" - Data Not Applicable "0" - Null value

Table 9-3
North Lahontan Hydrologic Region Water Use and Distribution of Dedicated Supplied

	1998			2000			2001		
	Applied Water Use	Net Water Use	Depletion	Applied Water Use	Net Water Use	Depletion	Applied Water Use	Net Water Use	Depletion
WATER USE									
Urban									
Large Landscape	2.3			2.6			2.6		
Commercial	9.0			9.7			9.3		
Industrial	12.5			12.5			12.5		
Energy Production	0.0			0.0			0.0		
Residential - Interior	7.9			9.0			8.7		
Residential - Exterior	6.2			6.3			7.2		
Evapotranspiration of Applied Water		8.8	8.8		8.7	8.7		9.4	9.4
Irrecoverable Losses		0.0	0.0		0.0	0.0		0.0	0.0
Outflow		14.9	14.9		16.1	16.1		16.5	16.5
Conveyance Losses - Applied Water	0.0			0.0			0.0		
Conveyance Losses - Evaporation		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Irrecoverable Losses		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Outflow		0.0	0.0		0.0	0.0		0.0	0.0
GW Recharge Applied Water	0.0			0.0			0.0		
GW Recharge Evap + Evapotranspiration		0.0	0.0		0.0	0.0		0.0	0.0
Total Urban Use	**37.9**	**23.7**	**23.7**	**40.1**	**24.8**	**24.8**	**40.3**	**25.9**	**25.9**
Agriculture									
On-Farm Applied Water	375.1			462.4			428.4		
Evapotranspiration of Applied Water		241.1	241.1		301.3	301.3		281.1	281.1
Irrecoverable Losses		19.5	19.5		20.2	20.2		12.5	12.5
Outflow		66.8	66.8		75.8	75.8		74.7	74.7
Conveyance Losses - Applied Water	23.5			13.4			6.2		
Conveyance Losses - Evaporation		2.3	2.3		1.7	1.7		1.0	1.0
Conveyance Losses - Irrecoverable Losses		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Outflow		1.5	1.5		1.1	1.1		0.0	0.0
GW Recharge Applied Water	0.0			0.0			0.0		
GW Recharge Evap + Evapotranspiration		0.0	0.0		0.0	0.0		0.0	0.0
Total Agricultural Use	**398.6**	**331.2**	**331.2**	**475.8**	**400.1**	**400.1**	**434.6**	**369.3**	**369.3**
Environmental									
Instream									
Applied Water	84.6			85.0			84.5		
Outflow		84.6	84.6		85.0	85.0		84.5	84.5
Wild & Scenic									
Applied Water	404.1			233.3			152.5		
Outflow		95.6	95.6		56.2	56.2		28.7	28.7
Required Delta Outflow									
Applied Water	0.0			0.0			0.0		
Outflow		0.0	0.0		0.0	0.0		0.0	0.0
Managed Wetlands									
Habitat Applied Water	18.7			25.9			20.5		
Evapotranspiration of Applied Water		13.2	13.2		19.8	19.8		16.9	16.9
Irrecoverable Losses		0.2	0.2		0.3	0.3		0.2	0.2
Outflow		0.0	0.0		0.6	0.6		0.0	0.0
Conveyance Losses - Applied Water	0.0			0.0			0.0		
Conveyance Losses - Evaporation		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Irrecoverable Losses		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Outflow		0.0	0.0		0.0	0.0		0.0	0.0
Total Managed Wetlands Use	18.7	13.4	13.4	25.9	20.7	20.7	20.5	17.1	17.1
Total Environmental Use	**507.4**	**193.6**	**193.6**	**344.2**	**161.9**	**161.9**	**257.5**	**130.3**	**130.3**
TOTAL USE AND LOSSES	**943.9**	**548.5**	**548.5**	**860.1**	**586.8**	**586.8**	**732.4**	**525.5**	**525.5**
DEDICATED WATER SUPPLIES									
Surface Water									
Local Deliveries	501.4	501.4	501.4	469.5	469.5	469.5	311.8	311.8	311.8
Local Imported Deliveries	0.3	0.3	0.3	0.3	0.3	0.3	3.3	3.3	3.3
Colorado River Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CVP Base and Project Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Federal Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SWP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Environmental Instream Flow	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Groundwater									
Net Withdrawal	41.8	41.8	41.8	112.0	112.0	112.0	189.6	189.6	189.6
Artificial Recharge	0.0			0.0			0.0		
Deep Percolation	46.7			49.6			45.3		
Reuse/Recycle									
Reuse Surface Water	348.7			223.7			161.6		
Recycled Water	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
TOTAL SUPPLIES	**943.9**	**548.5**	**548.5**	**860.1**	**586.8**	**586.8**	**716.6**	**509.7**	**509.7**
Balance = Use - Supplies	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*-15.8*	*-15.8*	*-15.8*

Figure 9-2
North Lahontan Hydrologic Region 1998 Flow Diagram
In Thousand Acre-Feet (TAF)

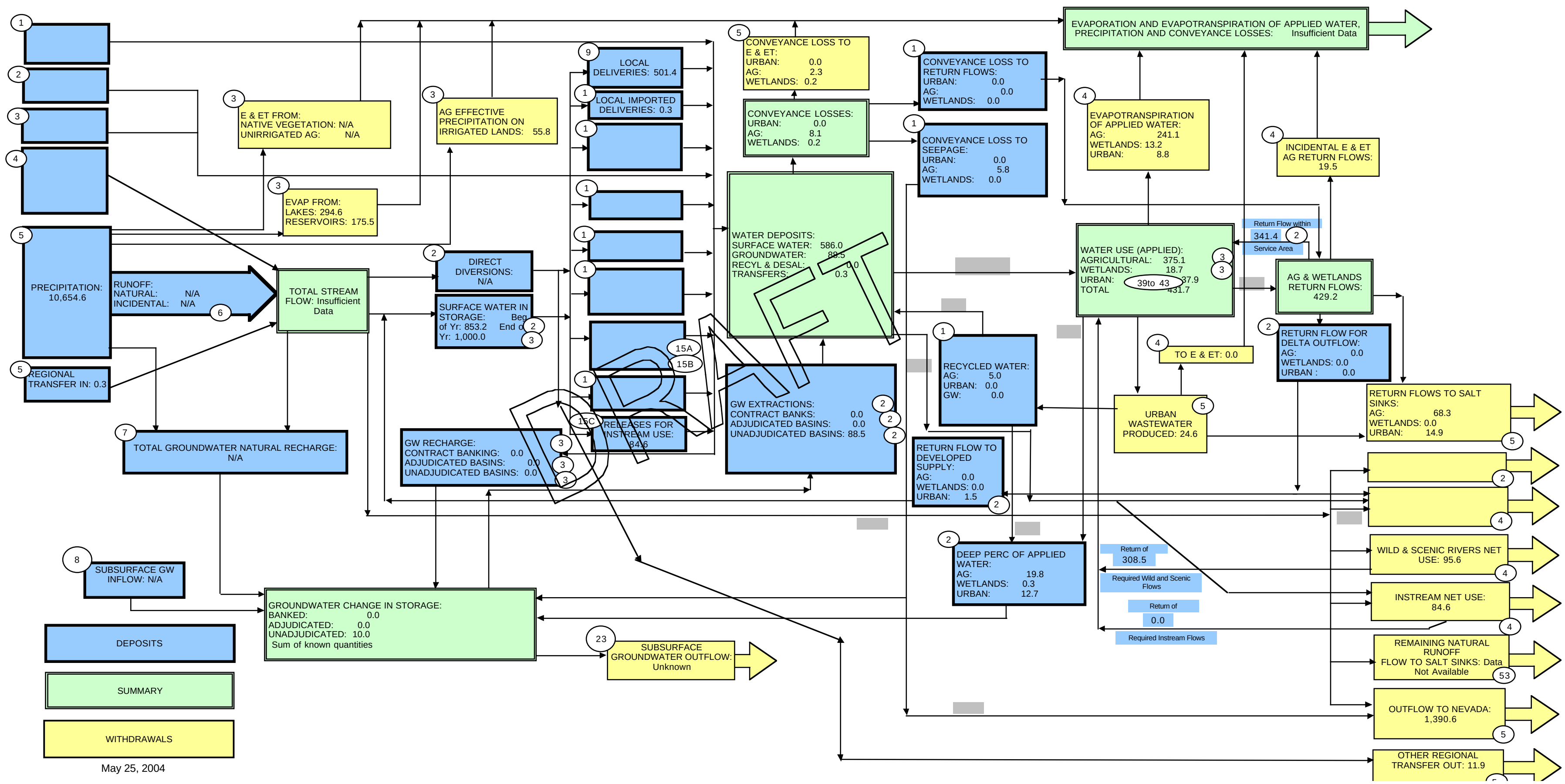


Figure 9-3
North Lahontan Hydrologic Region 2000 Flow Diagram
In Thousand Acre-Feet (TAF)

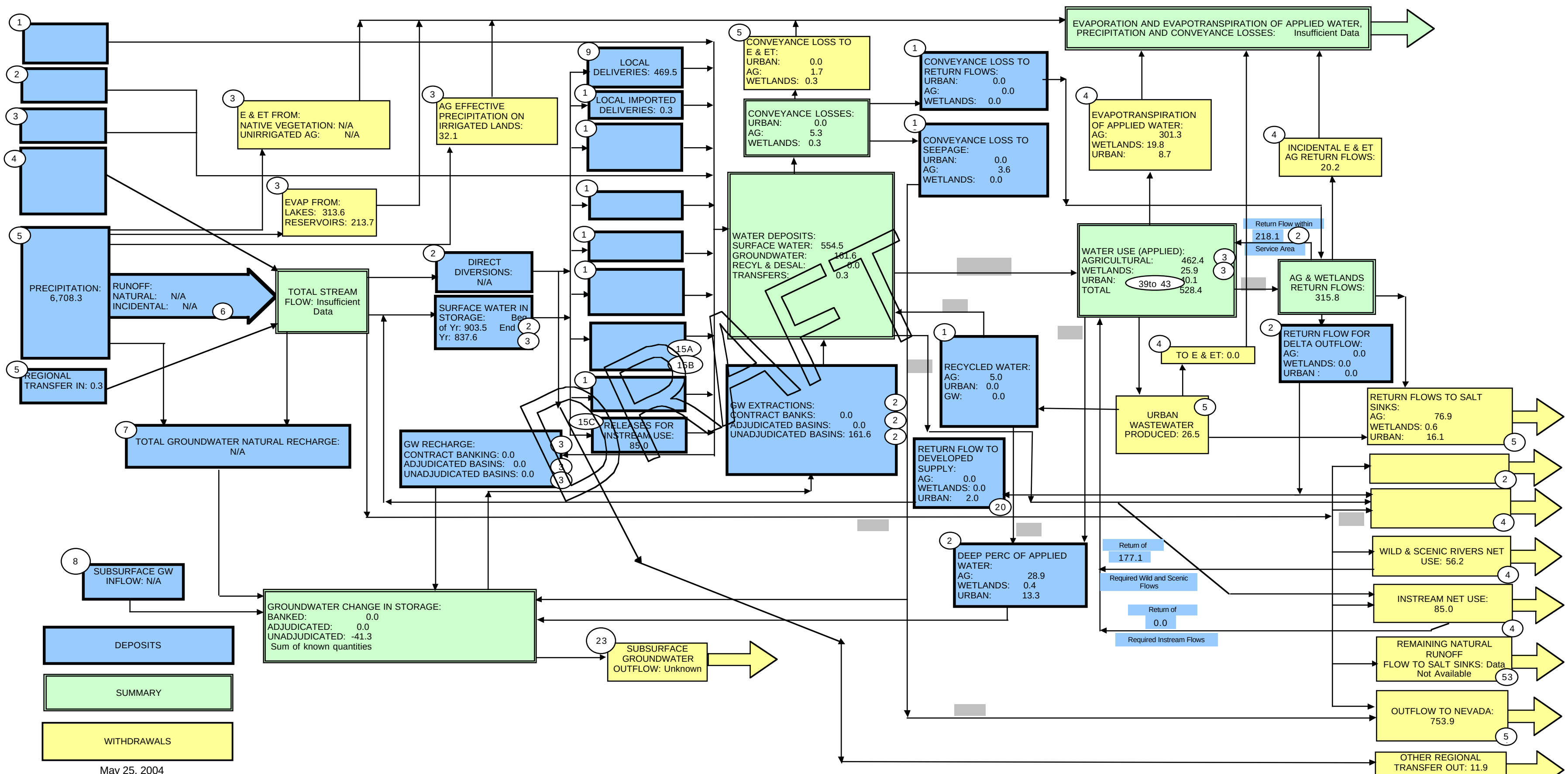
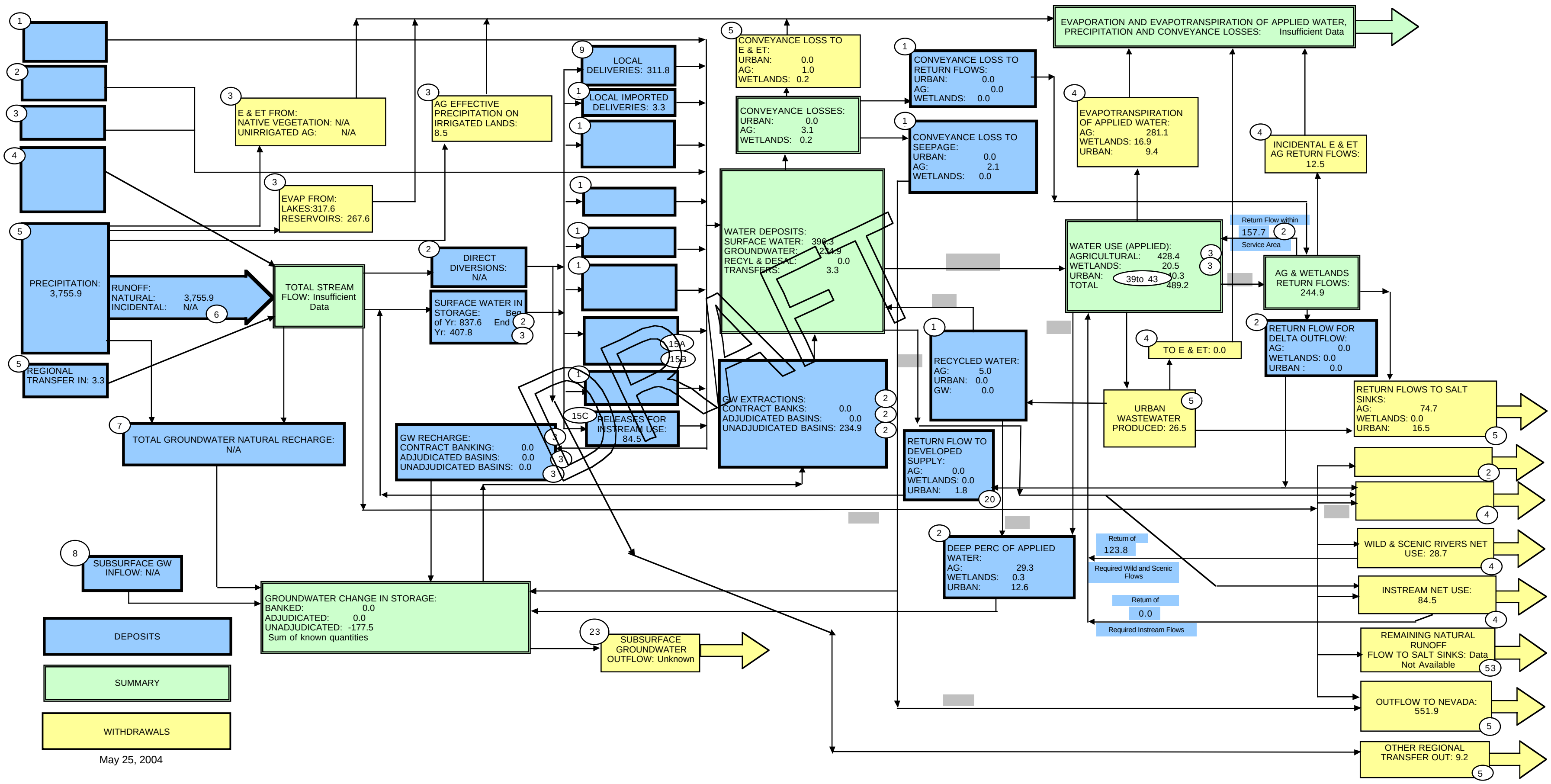


Figure 9-4
North Lahontan Hydrologic Region 2001 Flow Diagram
In Thousand Acre-Feet (TAF)



May 25, 2004